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SOIL CONSERVATION

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SOIL CONSERVATION

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★ THIS MONTH ★

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SOIL STEWARDSHIP.—More than a million Georgians participated in Soil Stewardship Week May 6-13, 1956. And this does not include newspaper readers, radio listeners, or television audiences.

Soil Stewardship Week was jointly sponsored by the State Soil Conservation Committee and the State Association of Soil Conservation District Supervisors. It was the outgrowth of Soil Stewardship Sunday and Soil Conservation Week combined into a single week of soil and water conservation activities.

Outstanding accomplishments during Soil Stewardship Week resulted from the cooperative effort of all the agricultural agencies working together to get people interested in soil and water conservation. Also participating in the event were civic clubs, ministers, newspapers, radio and TV stations, schools, farmers and other individuals.

A summary of activities includes: 24 special editions of newspapers with 793 articles, 88 editorials, 358 pictures, and 304 advertisements; 264 radio programs; 347 radio flashes; 13 TV programs; 42 TV flashes; 981 sermons; 57 tours; 56 demonstrations; 206 general meetings; 117 civic club programs; 262 motion picture shows; 33 exhibits and displays.

FRONT COVER.—The sun peeps through a break in the clouds above an Idaho farm.

Greater Profits From Greater Care

By DAVID N. SUDDUTH

EFFICIENT use of land, rather than exploitation, is the objective of Malcolm S. Anderson, who owns a 193-acre irrigated farm 5 miles northeast of Lucerne, Colo.

Anderson acquired this farm in 1950. Even though it had a past record of high production, he soon recognized the need for further improvements. Shortly after taking over the farm he applied to the board of supervisors of the West Greeley Soil Conservation District to have his land included in the district. This enabled him to request technical assistance from the Soil Conservation Service.

The first step in the conservation program was preparation of a detailed soils survey of the farm. The soils survey formed the basis on which Anderson and SCS technicians then developed a plan of conservation.

First attention was given to improving the field grades by leveling operations. After the first leveling job was completed, Anderson noted that he had accomplished eight objectives with that first job.

"I was able to eliminate point rows and a seepy dike, and also to equalize the length of irrigation runs and the size of my fields," he stated. "At the same time I could shorten the length of irrigation runs, which saved water. I ran my rows across the slope rather than downhill. This checked erosion between the rows.

"Besides," he added, "this job enabled me to redistribute and reuse my water. A beneficial change to about 100 acres of cropland was brought about by tying the field into existing grades."

There is little doubt in Anderson's mind that a good quality job of leveling pays off in more ways than one. He has plans to do more in the future. Erosion of head ditches on sandy soils, seepage loss of valuable irrigation water, and a high water table in some of the cropland

Note.—The author is work unit conservationist, Soil Conservation Service, Greeley, Colo.

Malcolm S. Anderson and part of his herd of feeder cattle.

Concrete lined irrigation ditch on the Anderson farm.

were other problems that Anderson faced.

He approached these problems with a combination of practices. To date he has concrete-lined about 5,000 feet of main head ditch. Drops were installed in ditches on the steeper slopes to step the water down the slope in level sections from which he can take water to irrigate row crops. This solved the erosion problem on his head ditches. Water losses through sandy soils, which had been feeding a seep-spot below the ditch at one point on the farm, also were eliminated.

"I think," said Anderson, "that one of the most important benefits has been the labor I've saved in irrigating my crops from lined ditches."

Anderson also joined with his neighbors in lining about 1,200 feet of supply ditch crossing a leaky dike. This resulted in saving considerable water for delivery to the farm.

Individual field drainage was the next problem to be worked out. He called on soils and engineering technicians of the SCS to help him.

They surveyed ground elevations and made test borings to a depth of 9 feet over the entire area affected by subsurface seepage. This investigation enabled technicians to obtain information on the movement of underground water, the direction it was flowing, and the depth to the impervious material that was preventing downward movement of water thus causing the seep spots.

This information was used to design a tile drain system on the impervious underground layer where it intercepts the underground water as it moves into the affected area. The water is led off on grade to a point of disposal. In 1954, Anderson installed drains totalling about 1,960 feet of tile which resulted in reclaiming approximately 24 acres of cropland. The followup treatment is equally important in reclaiming drained land. The area will be planted to salt tolerant crops that require heavy applications of water in order that soluble salts in the soil can be diluted and leached down and out of the root zone of the crop.

Anderson believes in a balanced program of conservation farming with the commonly known vegetative practices receiving just as much attention as the structural practices.

"Since my leveling and drainage work, I am now able to use a good rotation," he says. His rotation, which he refuses to disturb, consists of 3 fields in alfalfa for 3 years of production, 2 fields in corn, 2 fields in beets, 1 of small grain, and a new seeding of alfalfa. One field of alfalfa is plowed out each year.

"My feeding program balances out my setup" he says, although he admits that sometimes he has his fingers crossed when he takes a look at the cattle market. Anderson feeds about 22 carloads of cattle a year. This is the manufacturing plant for the valuable manure that goes out to the cropland to build up organic matter and soil structure.

"The program works hand in glove," says Anderson. "I figure that if I can feed 1 animal per acre of irrigated land on a year-round basis in a well-bedded feed lot, I will get around 30 tons of manure for each acre of beet ground annually." He supplements this with commercial fertilizers.

"We're experimenting with spreading man-

Laying 6-inch tile drain on the Anderson farm.

ure and fall plowing these sandy soils," he commented. When the wind erosion hazard of fall plowing sandy soils was pointed out to him, he agreed and added, "This is strictly an experiment and if it doesn't work we will go back to spring plowing."

Anderson summed up with the statement: "Conservation farming is a two-way proposition. You take greater profits from the soil but you have to give the soil greater care to do it."

Colorado Districts on Educational TV

By HERBERT I. JONES

COLORADO'S Upper Platte Association of Soil Conservation Districts has been accepted as the 20th member of the governing council of KRMA-TV Denver. The station devotes all its programs to educational television. The Platte Valley group will represent the state association of districts. George Weaver, cattle rancher and district supervisor of the Fort Collins SCD, has been named temporary head of the educational effort. Weaver will attend monthly management meetings of the council and will help lead the fund drive.

The TV Council, made up of educational and cultural agencies, numbers among its members: Colorado University, Colorado A & M, Denver University, the Denver Bar Association, the American Institute of Architects, the American Institute of Banking, and the Petroleum Industry Institute. The entire operation of the station is in the hands of the council. Membership requires, in addition to substantial financial support, a record of public service to the area, and a willingness to supply program material.

The council's budget for 1956 calls for an expenditure of $125,000 for operations alone. Program participants pay their own production costs. KRMA facilities were built and paid for by the Denver Public Schools.

Currently, air time is 2 hours each weekday night from 7 to 9 p.m. About 360,000 TV sets are within reach of KRMA's signal. Many of these are in the rich irrigated farm section of the South Platte Valley. Farmers and ranchers in at least 25 districts can view the educational programs. Estimates indicate that about 87 percent of farm families in this area have TV sets.

Council plans call for stepping up power as progress dictates. A new building to house studies and equipment will soon replace the temporary quarters located in Denver's world famous Opportunity School.

On the air since February 1, outstanding programs have been "Redman's America," a series on Indian culture; conversational Spanish lessons; hunting and fishing news; garden hints; and special children's programs. About 60 percent of the programs are live.

Rehearsal of an educational program in the studios of KRMA-TV

District representatives view membership on the council and the privilege of using KRMA facilities as an outstanding opportunity to present conservation facts. Their enthusiasm is shared by other council members who welcomed the Upper Platte group. John Eastlick, Public Library director, and council president, commenting on the district's membership said, "The application of sound soil and water conservation methods is important to every farmer, to every American. We want to help spread information about these methods and aid in their adoption by Colorado citizens."

Note:—The author is soil conservationist, Soil Conservation Service, Littleton, Colo.

Sweetclover, Sheep, and Wheat

By CHARLES T. WEBB, JR.,
VERN NELSON, and DAVE HICKMAN

FOR the last 5 years Washington farmers, in the vicinity of Palouse and Pullman, have been "eating their cake and keeping it too." They have done this by pasturing sheep on second-year sweetclover, then plowing under the residue. In most cases the sheep are transit flocks from other areas. When an animal eats the high-nitrogenous material it uses only 20 percent of the nitrogen to make up the protein of its body and returns the other 80 percent to the soil.

A good sweetclover seeding will return a lot of nitrogen to the soil. In the Palouse area when sweetclover is turned under green, in early summer, heavy erosion usually results the following winter. When using the sweetclover for production of lamb chops plowing is delayed until the ground is dry. A cloddy condition from plowing then will materially reduce erosion during the winter.

The soil in this area is a deep silt loam with a moderately tight subsoil. Most of the yearly rainfall, an average of 21 inches, comes in the late fall when winter wheatfields are vulnerable to erosion. This is especially true where summer fallow or early-plowed sweetclover has preceded the wheat. The soil, which averages about 6 feet in depth, will hold about 18 inches of moisture. With the average annual rainfall, there is more water than can be accommodated in the soil column unless a crop is grown each year. Where this is not done water is lost by percolation or by surface runoff. In the hilly topography of the Palouse surface runoff causing severe erosion is an ever-present threat.

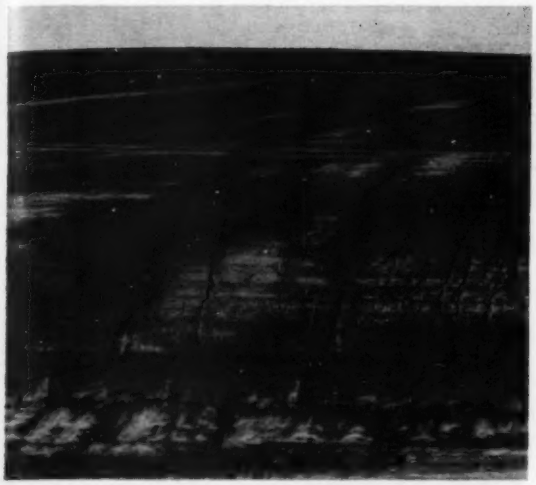
Over a 3-year period (1952-1954) a comparison was made on fields where sweetclover was plowed under as a green manure crop, the usual practice, and fields where sheep were pastured till late summer or fall and then plowed. The yield of winter wheat was close in each case as shown below:

	Number of fields	*Bushels of wheat per acre*
Sheeped-off sweetclover	30	54.4
Green manure sweetclover	26	52.0

The greatest increase in the crop yield, after sheeping sweetclover, came on the clay ridges

Note.—The authors, all with the Soil Conservation Service are, respectively, work unit conservationist and conservationist of Pullman, Wash., and conservation aid of Palouse, Wash.

Sheeping-off sweetclover on Palouse hillside.



Erosion caused by winter and spring rains on Palouse wheatfield that was clean fallowed the previous summer and fall.

where it is natural for sheep to bed down during the night. With increase of manure on the ridges, where fertility was low, a highly beneficial effect was obtained.

Comparing the effect on erosion of green-manured fields and sheeped-sweetclover fields, data were obtained from 182 fields totaling 15,210 acres in the North and South Palouse Soil Conservation Districts. Data from fields plowed early or late, were kept separate. In the table below the green manured fields plowed after July 1 were considered late, but the late pastured fields were not plowed until after August 15.

Fields in sweetclover	Number	Acres	Soil loss, ons per acre
Early plowed, not pastured	66	5,280	13.9
Late plowed, not pastured	80	6,320	6.8
Late plowed, pastured	36	3,610	3.3

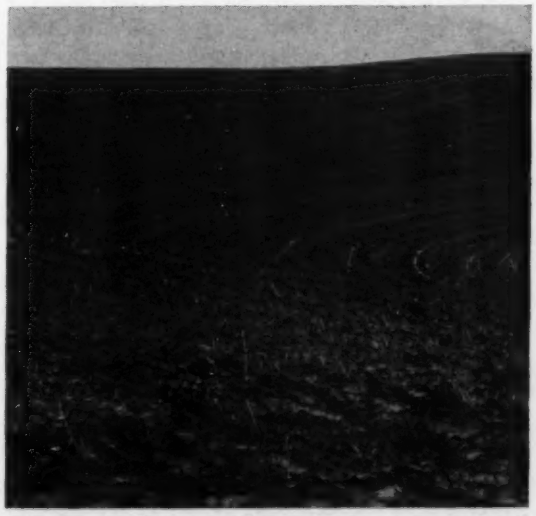
The date of plowing was the big factor in reducing erosion. Because of this reduction SCS technicians are interested in the practice of pasturing sweetclover. When sweetclover is plowed early, in the Palouse area, the field generally must be worked several times for weed control. This "fining" of the soil is largely responsible for the heavy soil loss. On the other hand, where sweetclover is pastured and plowed late, the ground is dry and works up rough. It is in good shape to take the fall and winter rains. In addition to reducing erosion, late plowed fields eliminate the cost of weed control.

"I plan to pasture my sweetclover from now on," says Raymond Harlow, who farms 3 miles west of Pullman. "In the past I have had severe erosion on early-plowed sweetclover, but for the last 3 years I have received cash rent and have kept the soil on the hills by pasturing and plowing late." He added, "It's kinda rough on the drills, but it sure pays in erosion control."

The same results can be expected where the operator pastures the clover with his own herd of cattle or sheep. However, in many cases, the number of cattle or sheep owned by the farmer is not large enough to fully utilize the available pasture. The important reason for reporting only on itinerant bands is that records are kept. The records are necessary for the sheepman to settle with the farmer for the pasture used.

The sheepmen have had difficulty with bloat. To date, however, their loss is less in pasturing sweetclover than on open range in the mountains. After becoming accustomed to the sweetclover, the sheep will make more rapid gains on sweetclover than on the range.

George Hislop of Spokane, Wash., pastures several bands of sheep in the Palouse. Accord-



Palouse wheatfield on which sweetclover was pastured during previous summer and plowed rough in the fall shows little signs of erosion.

ing to him an average stand of sweetclover will return $5 per acre to the farmer when he receives 1 cent per head per day, the usual charge. "It takes an exceptionally good stand and growing season to return $10 per acre," Hislop says. "We did pasture 110 acres with approximately 1,300 head for 3 months, which I believe figures out about $10 per acre," he comments.

By reducing erosion fourfold, maintaining good yields and receiving a small cash return, some Palouse farmers are "eating their cake and keeping it too."

Earth Moving for Soil and Water Conservation

By JAMES L. AULL

SOIL Conservation District cooperators in South Carolina are big operators when it comes to earth moving. As a combined group, they rank among the biggest in the State.

Soil and water conservation practices that involve the most movement of dirt are ponds, drainage, and terracing. A breakdown of these practices on which Soil Conservation Service technicians gave help during 1955 shows the following: ponds constructed, 3,266; drainage constructed, 298 miles; terraces constructed, 1,958 miles. Each of these practices is mainly a soil moving operation.

An analysis of the scope of these activities reveals some interesting statistics in connection with moving soil. Construction of ponds involved the moving of 11,006,458 cubic yards; construction of drainage ditches involved 1,292,931 cubic yards; and construction of terraces involved 2,584,560 cubic yards. These jobs were accomplished during the 1955 calendar year in South Carolina. Add them all up and you have the staggering total of 14,883,949 cubic yards of soil moved.

This much soil would build a dam 30 feet high and 23 miles long with an 18 foot roadway on top. Looking at it another way, this amount

Earth moving equipment starting construction of a farm pond.

of soil would fill enough standard 41-foot freight gondolas to make up a continuous train that would take 18 hours, traveling at 60 miles an hour, to pass a given point.

This big earth moving operation didn't just happen by itself. In addition to technical help from the SCS, and cost-sharing assistance from the ACP, contractors and equipment dealers played a major part. Two hundred and ninety-six contractors contributed the use of 175 draglines, 315 crawler tractors including bulldozers, and 115 scrapers. In addition, innumerable farm tractors were used on terrace construction.

Dragline digging a drainage ditch.

Note.—The author is state engineer, Soil Conservation Service, Columbia, S. C.

A Second Look At Brighton

Kudzu, tall fescue, and sericea help protect the water supply of a rapidly growing urban area.

By C. S. BRITT and C. S. SLATER

THE growing water needs of suburbs built along the Maryland borders of the District of Columbia made Brighton Dam a necessity. Back of it the waters of the Patuxent River form Triadelphia Lake, a major storage basin of the Washington Suburban Sanitary Commission. Now a second dam has been built below the Brighton to meet an ever-expanding need for water. Needless to say the storage basins back of these dams are being protected by erosion controls against loss of capacity by the deposition of sediments.

Brighton Dam, immediately after its construction in 1943, posed some special problems in erosion control. A highway runs across the dam. Grading of the approaches left huge cuts and raw fills devoid of vegetation. After heavy rains, water flowed swiftly along roadside gutters picking up earth and gravel and transporting it to the lake below. This was a problem where knowledge gained in its solution could be applied to roadside ersion throughout the watershed and, as we now know, to the second dam downstream.

The main problem was erosion control with vegetation. Three kinds of plants proved to be of outstanding value. They were tall fescue (Kentucky 31), lespedeza sericea, and kudzu.

Difficulties had to be met on each site where a trial planting was made. Rabbits denuded fresh-set kudzu crowns as fast as they grew

Note.—The authors are soil conservationists, soil and water conservation research branch, Agricultural Research Service, Beltsville, Md.

Air view of Brighton Dam and Triadelphia Lake.

Kudzu was used on many of the steeper and long slopes in the Brighton watershed.

until they were protected by squares of wire netting placed over the succulent growth. Once established the kudzu outgrew the rabbits. Some of the other difficulties encountered in the watershed are illustrated in the following excerpts from field notes:

Site 1: Roadbanks on either side need shaping before applying manure, fertilizer, and sericea hay for seed and mulch. Site 11: Fill in beside cattle culvert and divert water to pasture above cattle crossing. Contact the farm owner about diverting water to pasture. Site 17: Steep banks on either side will need stakes to keep mulch from sliding when planted to lespedeza. Site 18: Deep gullies must be filled and water diverted. Shoulder of fill should be paved. Site 31: Plant to kudzu. Dig holes to set the crowns and place fertilizer in slot about 6 inches away from kudzu. Site 47: These banks are stabilizing with honeysuckle. Let honeysuckle take over. Apply fertilizer. Site 60D: Poorly drained. Remove boulders, smooth, fertilize, and fall plant to Kentucky 31 fescue. Use mulch.

The intent of these excerpts is to recall our first look at Brighton when heavy rains moved tons of soil down roadside gutters to the lake below. A second look today reveals a pleasing landscape where erosion is controlled—the soil stabilized under a protective mantle of living vegetation—a permanent supply of clear, cool water.

Because fertility was so low on the exposed subsoils, heavy applications of fertilizer were used to promote thrifty growth of vegetation. Periodic maintenance and fertilization will be necessary to insure continued vigorous growth and effective erosion control.

Ideas and help from many sources made the conservation plan that protects Brighton Dam and the Triadelphia Lake watershed. The Washington Suburban Sanitary Commission, University of Maryland, Soil Conservation Service, Howard County Commissioners, Montgomery County Council, and Howard and Montgomery Soil Conservation Districts all contributed to the program.

Tall fescue stabilized this eroding bank. A straw mulch (above) was used at planting time.

A DISTRICT BILLBOARD

By HAROLD A. LIVERS

WHEN Antelope County, Nebr., farmers approach Neligh from the southeast on Highway 275, they are greeted by a big new sign erected last fall on property of the Antelope Soil Conservation District.

On the sign 9½-inch red enameled letters that can be put up and taken down like letters on a theatre marquee spell out timely soil conservation messages and slogans.

The 6 by 14-foot sign is trimmed in green and white with a green enameled background for the district's name.

Slots in the 2-inch cross pieces allow the letters to be shoved up and then dropped down. The letters are made of pressed hardboard.

The area around the sign was recently landscaped with silver junipers at the ends and Pfitzer junipers across the front. The area behind the sign was planted to Austrian pines.

During the winter months Supervisor Merwin Olson placed three sign lights across the top. A time clock regulates the lighted sign during the evening hours.

Supervisors trimmed the sign during the Christmas season with cedar boughs and colored lights and the message, "MERRY CHRISTMAS AND A HAPPY NEW YEAR."

The sign was constructed locally with the material, painting, letters, and erection costing about $225.

The $100 award from the *Omaha World-Herald* based on local activity of the board of supervisors last year was used to pay costs of wiring.

Note: The author is Work Unit Conservationist, Soil Conservation Service, Neligh, Nebr.

District supervisors (left to right): James C. Snodgrass, C. V. Taylor, and F. F. Reinke watch SCS conservationist where pan was not shattered, suffered severe drought damage.

Break Up The Traffic Pans

No. 17

This is the seventeenth of a series of articles to appear from time to time in explanation of the various phases of research being conducted by the Department of Agriculture on problems of soil and water conservation.

By W. A. RANEY

SOME soils have layers that interfere with the movement of water and air and limit the penetration of plant roots. These layers are called pans. Two types of pans are encountered. Horizons such as clay pans or silt pans that are formed in the subsoil by the natural processes of soil development represent one type. The other is represented by soil layers that are compacted by excessive or improper tillage, or by implement or animal traffic.

Note.—The author is soil scientist, soil and water conservation research branch, Agricultural Research Service, U. S. Department of Agriculture, Beltsville, Md.

This second type is frequently called a traffic pan. It is becoming more and more common as heavier tractors and farm implements are being used more frequently.

There is some evidence to indicate a normal downward movement of clay to the top of a traffic pan. Under these conditions the problem will likely become more serious from natural processes unless something is done to overcome the traffic pan.

Traffic pans are most common in medium textured soils—loam, sandy loam, and silt loam. These soils, which are generally devoted to row crops, are subjected to a greater amount of traffic than nonrow crop soils. If a traffic pan is present, it is found just below the zone disturbed by normal tillage practices and is similar in texture and chemical properties to material immediately above and below it.

By reducing the rate of downward movement of water, traffic pans reduce the amount of water that is stored in the soil during periods of surplus rainfall. Pans also markedly reduce irrigation efficiency in the arid region. Since

Drought injury was slight to soybeans in foreground, where traffic pan was shattered; beans in background, where pan was not shattered, suffered severe drought damage.

root growth into dry soil is negligible, any reduction in water storage may effectively reduce rooting depth.

Poor aeration in the traffic pan may also limit root penetration. Cotton roots have been known to penetrate traffic pans when there was moderate soil moisture and adequate aeration, but failed to do so when soil moisture content approached field capacity and aeration was inadequate. This condition of poor aeration during the period of most rapid plant growth causes plants to be shallow rooted and renders unavailable any moisture that is stored in the subsoil.

The poor internal drainage associated with traffic pans frequently causes severe soil erosion, poor seedling survival, and by delaying cultivation may also result in appreciable weed problems.

Roots of a cotton plant that are unable to penetrate a traffic pan.

Improper use of farm machinery and tillage of wet soils are probably the major causes of traffic pan formation.

Soil moisture acts somewhat like a lubricant that reduces the frictional resistance between soil particles, and increases the amount of compaction from a given amount of implement traffic. There is a decrease in the ability of soil aggregates to withstand implement traffic, without being destroyed, as moisture content increases from an air dried condition. These relationships explain why the subsoil, which usually has a higher moisture content than the surface soil, may be compacted by implement

A chisel partially shatters a traffic pan.

traffic when surface soil has a moisture content that is optimum for operation of most tillage implements. These relationships between soil moisture content and subsoil compaction emphasize the need for minimizing tillage operations when soil moisture is optimum for compaction.

Insofar as possible, operations requiring traffic should be completed when the soil is relatively dry. Soil bearing strength is greatest and compaction susceptibility least at the end of the cropping season when soil moisture is depleted.

A combination of tillage and crop management are necessary to overcome traffic pans. Tillage operations alone may shatter a pan but the effects are usually temporary because the stability of soil structure of the pan is low. Stabilizing soil structure in the pan requires root development in the pan where root development is restricted unless the pan is shattered by tillage implements.

Traffic pans must be shattered when the soil is relatively dry, and the tillage operation must give a continuous shatter to the pan for maximum effect. When the pan is wet, it will not be shattered and the compaction problem may be accentuated.

When the soil is very dry, more power will be required to pull a shattering tool through the soil than when the soil is slightly moist but the shatter effects will extend a greater distance on either side of the implement and lateral

spacing of the shattering tools may be increased.

The depth to which shattering tools must be run should be determined by the depth to and thickness of the pan. For effective shatter tillage must extend below the pan.

There must be sufficient rainfall or irrigation following the shatter to replenish subsoil moisture reserves before best results can be expected. Even then, there may be little gains in crop yields above those obtained on non-shattered areas if rains are frequent enough to prevent moisture deficiencies in the surface soil. It is not economical under arid conditions to add irrigation water frequently enough to prevent soil moisture deficiencies on traffic pan soils where roots are restricted to the surface few inches of soil.

If a pan is shattered for two or three successive years, there are indications that cotton, corn, and soybean roots will impart enough durability to the shattered pan to reduce the need for further shattering operations for a while.

The marked response to tillage in overcoming traffic pans has led to indiscriminate use of such treatments on soils with no pan. There is little likelihood of either soil or plant response to such tillage where there is no pan, or where soil is composed of montmorillonitic type clay that shrinks sufficiently on drying to crack open and shatter a pan naturally.

Sixth Graders Learn About Conservation

By BARRINGTON KING

IT started out as a poster contest but soon became a full-fledged conservation unit in 34 sixth grade classes in Wake County, N. C. And as the program enters its fifth year this fall, school officials report they're reaching a lot of people besides students with the conservation theme.

"We decided that if we could talk about growing coffee in Brazil, we might very well devote some time to crops we produce in North Carolina and the soil in which they grow," Superintendent Fred A. Smith explained. "We saw this thing had its economic side, too. And the bankers and other groups got interested.

"After 4 years," he continued, "we think we've gotten tangible results. We have found the children are working on something their parents are interested in as a home project. One man told me his son had taught him more about conservation than he'd ever learned before. Anything that can arouse interest like that is very much worthwhile."

Soil conservation district supervisors originally promoted the poster idea with school officials. Mrs. Katharine Revell, county supervisor of elementary education, wanted to get some materials to give the children background information. George L. Winchester, Soil Conservation Service work unit conservationist, got together the materials and worked with Mrs. Revell on the poster contest.

The contest was soon in full swing. After

Mrs. Katherine Revell (left) and pupil show some of the conservation posters displayed at Apex school, Wake County, N. C.

Sixth grade pupils studying conservation at Fuquay Springs School, Wake County, N. C., Mrs. Katie Ragan, teacher.

studying the materials, the pupils came up with some remarkably good posters on conservation. But to Mrs. Revell's trained eye, here was a subject that had much larger possibilities than a poster contest. She wanted to work up a conservation unit and discussed the proposal with Superintendent Smith.

"We were losing 50 percent of our students between the 9th and 12th grades," Superintendent Smith said. "We saw the need of some sort of terminal education—something that would be reflected in the economy. We think this soil and water conservation unit is at least part of the answer and that the time is well spent."

Mrs. Revell decided to put the unit in the sixth grade for this is when pupils are at the most inquisitive age and when they are most anxious to share with their parents and other people. By that time they have mastered the mechanics of reading, writing, and arithmetic and are ready to relate their knowledge to the life around them, she points out.

During a 6-week period, conservation is integrated with every subject studied, starting with spelling. They study new words that they have run across in conservation material. It is brought into their English classes, where they write compositions on various phases of conservation. It is introduced into the social studies. They go back to 5000 B.C. and trace the effects of conservation, or the lack of it, on human history up to the time of George Washington. Dr. Lowdermilk's "Conquest of the Land Through 7,000 Years" is the basis of these studies. They do conservation problems in arithmetic, where they have found the booklet "Down the River" very useful.

The Bank of Fuquay has furnished copies of "Down the River" and the Carolina Power & Light Company has provided copies of "The Story of Our Land." Another popular "textbook" has been "Let's Save Soil With Sam and Sue."

Although the program has far outgrown its original concept as a poster contest, posters are still an important part of it. Ten Lions Clubs in the county provide prizes for the class that has the child with the winning poster. Prizes consist of 2 softballs and 2 bats to the winning room in each school. Ten conservation meetings are sponsored by the Lions Clubs for awarding the prizes.

Youthful imaginations interpret the background information they have acquired into some unusual poster ideas. A poster in Mrs.

(Continued on page 43)

Conservation A Wise Investment

No. 18

This is the eighteenth of a series of articles to appear from time to time in explanation of the various phases of research being conducted by the Department of Agriculture on problems of soil and water conservation.

By E. L. SAUER

THE basic importance of land to the material and moral welfare of man makes conservation a must. Soil and water conservation measures protect agricultural land while it is in productive use. Soil conservation farm plans build up current productivity and protect the land for future use.

Many farm operators and landowners recognize the need for soil conservation and related improvements. But meeting the expenses for such improvements along with current operating expenses and family living costs presents a real problem for many farmers, particularly those on small or depleted and eroded farms.

As farmers continue to adjust their businesses to obtain the benefits of improved technology, such as new and improved machinery, improved crop varieties, fertilizers, insecticides and pesticides, chemicals for weed control, labor-saving livestock feeding and housing arrangements, they will need larger amounts of capital.

Is it wise to invest in conservation? As conservation sometimes means foregoing immediate income to increase future income, in times of lower net income farmers tend to reduce or eliminate expenses for conservation.

Twenty years of conservation studies indicate that a farmer should not reduce his expenditures for conservation if he is not operating at a high level of conservation. Conservation measures are not only effective in improving and maintaining soils for future use; they are also important in increasing current farm income. Efficient, high-volume production per acre is essential in maximizing farm returns. High per acre yields help to reduce production costs. Investments in measures to improve the land, including the application of limestone and fertilizers pay off in larger per acre crop yields and in higher quality of hay and pasture. Enough well-managed livestock to utilize forages produced under conservation plans help to increase the volume of farm output.

What is conservation? As used here, conservation includes the use of land within its capabilities; the use of practices that will lessen or prevent harmful soil erosion and water runoff, and improve drainage; and the maintenance or improvement of soil fertility and productivity.

Many farmers are interested in conservation as a means of obtaining large future incomes. Most farmers are also interested in increasing current yields and incomes. There is no serious conflict between these two interests. Present farming programs often need to be changed, and this may require the outlay of additional capital and a temporary reduction in current income. But research in Illinois indicates that this reduction in current income is soon more than offset by increased production and income.

Landlords and tenant farmers frequently overemphasize quick returns. Landlords who do this, however, often find their farms damaged and their income in later years reduced. Tenants, too, find that their ability to succeed as farmers and to rent highly productive farms depends on their acceptance of systems of farming that insure long time high production from the land.

Will conservation and improvement measures pay? In 1955, a random sample of operators of cash-grain farms who followed recommended soil conservation rotations, along with other appropriate conservation practices, spent about 50 percent more for fertilizer and land improvement than farmers with similar soil resources who did not follow a recommended conservation program. Returns were $32 an acre for

Note.—The author is agricultural economist, production economics research branch, Agricultural Research Service, U. S. Department of Agriculture, Urbana, Ill.

the conservation farms compared with $23 an acre for the others.

During the last 2 years, high-conservation farms in the northeastern Illinois slowly permeable soils earned $3.09 to $7.64 more net income per acre than comparable low-conservation farms. Total capital expense for conservation and related improvements was about twice as great on the high-conservation farms. Expenditures for land improvements and fertilizer have more than doubled on high-conservation farms in the northeastern Illinois area in the last 5 years. Apparently, these farmers are convinced that investments of this kind do pay.

In 1954, in the Hadley Creek pilot demonstration watershed in western Illinois, on farms of similar land use capabilities, yields of corn varied from 23 to 63 bushels per acre and net incomes varied from –$11.25 to $25.00 per acre. Expenditures for conservation and fertility improvement varied from zero to $15.77 per acre. Taxes, interest, land preparation, and, to a certain extent, costs of seed, machinery, and labor were about the same on the high-producing as on the low-producing farms.

Operators of these higher earning farms in the Hadley watershed either had soil and water conservation plans in operation or were developing them. In addition to using sound land use programs and adapted rotations, along with appropriate conservation practices and applications of fertilizer, these farmers followed efficient well-planned livestock programs.

A study of the Crab Orchard Lake watershed showed that the total cost of establishing the recommended conservation programs would amount to an average of $38.47 per acre for the watershed (1945-49 prices). The average annual total value of crops would be boosted from $10.88 to $21.47 per acre by applying the recommended conservation programs. Thus in this relatively low-income area, only 4 years of increased production resulting from the conservation program would pay for the cost of establishing it.

A 1954 study showed that contour farming should increase net returns by $5.45 per acre because it would permit a more intensive rotation while holding soil losses to a minimum. Stripcropping should increase net returns by $6.66 and terracing by $10 per acre.

Farmers on sloping land may choose between two methods of erosion control: (1) Keeping a high proportion of land in hay and pasture crops and (2) using terraces, stripcropping, contouring, and other conservation practices with a lower proportion of land in hay and pasture. Livestock farmers may choose the first alternative because they have a market for their forage crops. Grain farmers should rely more on terracing, contouring, and other conservation practices.

Farmers who have mainly level land find that a sound soil and water conservation program will (1) improve and maintain soil fertility,

Erosion on "low-conservation farms," northeastern Illinois.

soil tilth, drainage, and water-holding capacity of the soil, all of which are needed for high crop yields and (2) increase farm earnings, improve or maintain the capital resources of the farm, and help improve farm family living.

In a 10-year study in three selected Illinois areas costs and benefits of soil and water conservation practices and complete conservation farm plans were assessed to learn the economic effect on farms. This study is summarized in the bulletin "Soil Conservation Pays Off" (Ill. Agr. Sta. Bul. 575, 1954, reprint 1955).

The 10-year findings showed higher farm production and farm earnings were the measurable result of better soil conservation and fertility-improvement practices. Long-time benefits of soil conservation were significant in each area studied. Conservation and improvement practices, such as contouring and fertilization, generally increased production and income the first year. If the land was badly eroded and depleted, however, much effort, money, and time had to be expended to build productivity and earning power to a high level.

On the individual Illinois farms studied, the total costs of conservation application varied from $20 to $50 per acre. At 1954 farm prices, 10-year average net earnings of farms with conservation plans were $6 per acre per year higher than those on matched farms not having such plans. This difference was about $1,000 a year for a 160-acre farm, or about $100 a month more net income for a farm of average size (185 acres) in the areas studied.

Contour cultivation, stripcropping, and terracing permit more intensive crop rotations under given erosion hazards, reduce soil and water losses, increase crop yields, and generally reduce farm operating costs. Improved drainage results in more certain and higher crop yields and reduces operating costs. Mulch farming, on soils subject to erosion, reduces erosion hazards, permits more intensive crop rotations, helps to maintain and increase soil organic matter, and holds water in the soil. Timely irrigation brings higher yields and longer grazing seasons and makes it possible to grow specialized crops. Grass waterways, spillways, flumes, dams, ponds, living fences, and windbreaks contribute to a complete conservation plan when used with proper rotations and adequate fertilization.

Scenes on "high-conservation farms," northeastern Illinois.

Production and incomes on case farms in each area studied were better after they had adopted a conservation plan suited to the capabilities of the land and the abilities of the owner and operator.

In the 10 years from 1939 to 1948, 10 high-conservation farms in Madison and St. Clair Counties had almost twice the total expenditures of 10 low-conservation farms with similar land resources and types of farming ($25,493 for machinery, buildings and equipment, livestock and direct conservation expenditures compared with $13,980 for the 10 low farms).

The 10 high-conservation farms had a 10-year average annual expenditure of $7.09 per acre more than the low-conservation farms, or $1,219 more per farm. However, they also had an average annual *net* income of $8.36 per acre more than the low-conservation farms, or $1,438 more per farm.

Although more conservation may boost total expenses, returns from the additional farm production that results are usually large enough to more than offset the added cost. The economic use of capital must be determined on an individual farm basis. More and better management is needed along with the use of more capital.

If his capital is limited, a farmer will usually find it most economic to reduce expenditures first for those items that do not affect immediate crop yields.

Conservation improvement wisely made usually returns a good margin of income over expenses. Returns from these investments will not be fully realized in 1 or 2 years, but will extend over a period of years. Consequently, if money is borrowed and repayment is to be made from earnings, loans should be repaid over a period of years rather than on a short-term basis. The amounts of principal to be repaid during the first 2 or 3 years should be less than in the later years when there has been time for the plan to increase the productivity of the soil. As conditions vary from farm to farm by individual borrowers, conservation and improvement loans need to be tailored to the individual farm problems.

In the past, most farmers appear to have invested too little in land improvements. The result is a partial depletion of fertility and incomes that are lower than those that would have resulted had more adequate investments been made to improve the land. This lack of conservation investment is often due to short-tenure expectations on the farm and to the relatively slow returns from land improvements compared with returns from some other investments. The net cash income may actually decrease during the first 2 or 3 years of a conservation program.

Changes in income on the farms studied varied with the condition of the farm when the programs started, the speed at which the program was applied, the kinds and quantities of fertilizer used, the weather, and the quality of management of owner and operator.

By improving both present and future productivity, a conservation program usually increases net income in 1 to 4 years after it is started. The returns provide a safe basis for establishing credit to put the conservation program into effect.

Successful investment in conservation requires that farmers establish definite goals, develop sound conservation farm plans with approved technicians, and understand and follow the basic principles of farm management.

Some conservation measures may not work out as expected because of adverse weather or because they are poorly adapted to the individual farm. Farmers need to get the best advice available and they may also need to do some experimenting. For this reason, it is probably best to work gradually with a conservation plan rather than to make a heavy investment all at one time. This is particularly important to farmers who may be heavily indebted.

SIXTH GRADERS LEARN ABOUT CONSERVATION

(Continued from page 39)

Martha Jackson's class at Millbrook School is a good example. It shows a cloud in the form of an airplane flying over a conservation landscape. And tumbling out of the cloud comes a horde of raindrops, each wearing a parachute!

Last year Mrs. Jackson's class won $5 for having the most parents in the PTA. What did they do with the money? They bought 30 scrapbooks to keep their conservation items in. They got the items by writing letters to various sources as a part of their English classwork. Each child selected his own source to write to and they came up with a varied and original assortment of items.

"We like to let the children find their material by their own research," Mrs. Revell says. "And it's surprising what 35 children can come up with, once they've become interested in a subject like soil and water conservation."

A QUICK LOOK AT 4 FEET OF SOIL

By WILLIAM E. McKINZIE

POWER soil samplers have partially mechanized the soil survey business in western Nebraska. By the operation of a small lever, and 30 seconds of time, soil surveyors can have a 4-foot core of soil to analyze. Formerly the soil scientists dug or bored these holes by hand. Anyone who has dug postholes all day knows this is a slow, tiresome job.

By use of the mechanized soil sampler the surveyors obtain information as to depth, texture, color, and permeability of the soil. This information along with the slope, amount of erosion, drainage, and present land use is recorded on an aerial photograph and is called a soil survey. These soil surveys are used by the Soil Conservation Service as a basis for conservation farm and ranch planning, and making recommendations for land treatment.

This spring the Soil Conservation Service put into operation five ½-ton trucks on which hydraulically operated soil samplers were mounted. The unit is mounted directly behind the cab and is operated by a lever mounted on the left side of the truck box. At each location when the soil is to be examined the soil scientist inserts the 4-foot soil sampling tube into a coupling that is mounted on a vertical driven chain. This chain is coupled to a two-way hydraulic cylinder. By pulling out on the lever the hydraulic cylinder causes the chain to rotate and pushes the sampling tube into the ground. By pushing in on the lever the cylinder causes the chain to rotate in the opposite direction and raises the sampling tube. The sampling tube can be quickly removed and the soil examined.

Farming operations in western Nebraska are carried on in large fields and it is here that the power soil sampling unit works most efficiently. Since many borings must be made to find out about the soil pattern, small fields and many fences are a handicap. In the spring prior to planting, unless soils are wetter than normal, the power soil sampler can be used on all the irrigated land as well as all the dryland areas. During the summer, there are large areas of summer fallow and rangeland where the unit can be used. Again in the fall, after harvest, wide use of the unit can be made. Here in western Nebraska it is not uncommon to have open winters and with sampling tubes capable of penetrating 6 to 16 inches of frost, depending on organic and moisture content, some mapping can be done during the winter months.

Ed Sautter, area soil scientist, with 4-foot soil sampling tube and power equipped pickup that operates the sampler.

This new equipment not only benefits the surveyor but it increases his accomplishments as well as the accuracy of his work. In the past, the surveyor would carry his map and soil auger and walk over the land. With manpower being the only source of energy less holes were dug per farm; as a result the surveyor had less information to use as a basis for his soil survey. From experience here in western Nebraska a surveyor can increase his acres from 25 to 30 percent.

In addition to the 4-foot sampler, extensions may be added and the soil sampled to a depth of 12 feet. The 12-foot depth of sampling is used in locating dam sites and in drainage investigations.

Note.—The author is soil survey supervisor, Soil Conservation Service, North Platte, Neb.

Cow Guzzlers

California ranchers use open cisterns with water-proofed runoff areas for stock water.

By VINCE W. SHALLY
and HOMER W. MARION

FLOYD GRIGORY at San Ardo, Monterey County, Calif., took an old idea, and gave it a new twist. He calls it a "Cow Guzzler." Grigory is a cooperator with the Gloria Soil Conservation District, where they often have a water shortage on about 250,000 acres of rangeland.

What's a "Cow Guzzler"? It's a reservoir (or pond) that receives its water supply from rainfall runoff furnished from a waterproof apron adjacent to it. In other words, it's an open cistern constructed for use by livestock.

Uniform distribution of stock water is necessary for uniform use of range feed. An abundance of range feed is useless unless water is available in the vicinity. This is the problem on many ranches in southern Monterey County. Ranchers and soil conservation technicians in attempting to work out range management programs were stumped because of the poor distribution of water.

Note.—The authors, both with Soil Conservation Service, are, respectively, supervisory soil conservationist, Watsonville, Calif., and soil conservationist, King City, Calif.

Floyd Grigory.

Sheet metal nailed to redwood frame provides the runoff area for this pond.

Springs are few and far between; thousands of dollars have been spent drilling dry holes; dams received no runoff year after year; pipelines were often either too costly or, in many cases, there was no excess water to pipe.

Grigory, an ex-employee of the State Division of Fish & Game, drew on his experience with the successful "quail guzzler" to come up with the idea of a guzzler for cows. Conservationists later found that several other ranchers in the vicinity, including Herman Eade and the Smart Brothers, had similar ideas. During the past 2 years, 5 such guzzlers have been constructed.

Generally, cow guzzlers should be considered as a last resort after other possibilities for water development have been explored. When no other water source is available, however, they fill the need.

Sites for cow guzzlers are not critical. They can be constructed in flat, open country, canyon bottoms, or on mountain tops. The only limitation is a slope too steep for equipment operation. This wide range of site selection just about licks the problem of water distribution; but the decision to build a guzzler brings other considerations. First of all is the cost. Using road oil for a 1-acre apron, a fair estimate for average cost of a guzzler is $1,000 to $1,500.

A paved area across the road plus the hard surfaced road provide the runoff for this pond.

The cost of construction tends to limit the use of guzzlers for winter and spring water supply, especially in the low rainfall areas. Ranchers must consider the number of animals and the length of time for which water is desired. With this information, the engineers can design the size apron and reservoir to meet a rancher's needs.

In designing, consideration must be given to average rainfall, runoff, evaporation, and seepage loss. For example, in southern Monterey County, with an average rainfall of 11 inches, it is estimated that only 8 inches comes in storms of sufficient duration and intensity to contribute water to the guzzler reservoir. Reservoir seepage must be held to a minimum; lining may be necessary. Evaporation is an important item, especially if water is desired for summer or yearlong use. Fencing is required to protect the apron and reservoir from damage by trampling of livestock. The water is usually piped by gravity to a trough.

Design is based on the engineer's best information on the above factors. Guzzlers designed to date, in this 11-inch rainfall belt, supply water for about 100 cows for the winter and spring months with a 1-acre apron.

Evidence that ranchers are taking to the idea is shown by the fact that several additional requests for assistance in guzzler design have been submitted to directors of the Gloria District.

CONSERVATION PAYS—A 10-year study in 3 Illinois areas shows that an investment of $25 to $60 an acre in conservation practices often results in an extra $1,000 profit each year from a 160-acre farm.

TRAILER OFFICES

By TARLETON JENKINS

TRAILER field offices, which can be whisked to a new site by a pickup truck, have been moving into service in Texas and Oklahoma on small watershed construction work.

They are replacing frame office units that took considerable time to move (five man days on the average) and usually lasted only through 5 or 6 jobs before being claimed by the rubbish heap.

The trailer-type offices were first devised by Franz E. Bleckert of Fort Worth, construction engineer, and Glenn A. Beecham of Clinton, Okla., engineer assigned to the Washita River watershed.

A trailer field office may stay at one site until the job is finished. But since a contractor generally performs preliminary work on one structure site and then moves to another while waiting for concrete on the first site to "cure," the Soil Conservation Service engineer usually

Trailer office used in small watershed construction work, (above) exterior view, (below) interior view.

moves along with the contractor to each temporary site.

Blackert had been looking into the possible purchase of used school buses to be remodeled for this purpose. Then Beecham one day in Fort Worth spotted a house-trailer factory in operation. He sold Blackert on the idea.

Blackert designed the unit. Bid invitations were mailed. A contract for 16 units was let on a bid just over $900 per unit.

Floor space in each office is roughly 8 by 12 feet. They have a built-in desk and a work bench with hot plate for drying soil and concrete aggregate samples. A wall heater is ready for winter use. Fuel is butane, from tanks mounted on the front of the frame.

The exterior is aluminum, interior varnished plywood. Windows on all sides give ample ventilation. Glass fiber insulation is 1½ inches thick, with vapor barrier and aluminum foil sheeting to help. Axles and framing are heavier than ordinarily used so as to withstand hauling over rough terrain.

The idea already has clicked elsewhere. Soil Conservation Service people in other states are interested. And an oil company executive who saw one of the units placed an order for his firm.

PUBLIC SERVICE AWARD.—Willian R. Van Dersal, an assistant administrator of Soil Conservation Service, is 1 of 16 career civil service employees of the Federal Government granted the Rockefeller Public Service Award. He expects to take a year's leave from the Service, beginning about September 1, 1956.

Van Dersal says he plans to spend the year studying the way in which renewable natural resources are managed by governments—Federal, State, county, municipal, and special purpose governments organized to deal with various specific resources.

The study will involve a review of governmental organizations, staffing, functions, policies, attitudes, and administrative habits and customs; also the general operating techniques and procedures by means of which the governments develop and conduct their programs aimed at the management of natural resources.

"During the course of the study," Van Dersal states, "I plan to review the legal as well as the administrative and financial arrangements that facilitate or handicap an integrated attack upon the problems of resource management. The work will necessarily involve consideration of the proper sphere of activity as between the Federal and State Governments.

"I expect to headquarter in Washington, D. C. and review the manner of operation of several Federal agencies, and discuss basic questions with various members of the executive, legislative and judicial branches of the Government and do research in the Library of Congress.

"Field work will involve a study of six or more States to gain firsthand information about their way of managing natural resources. In addition, I expect to do some work in Canada, Australia, and New Zealand. Comparison of their institutes with American institutes ought to be of considerable value."

Although Princeton University, which administers the awards, does not require formal reports Van Dersal states that he will write up his major findings for publication at the end of the year.

DISTRICT HELPS LIBRARIES.—The fourth annual $25 donation by the Whatcom County Soil Conservation District was made to the Whatcom County and Bellingham, Wash., libraries last spring. Approximately 10 books each year are added to the growing list of books on all phases of conservation of natural resources. Both city and county libraries have full use of these books and they are also included in the county bookmobile program.

The district supervisors feel that a small annual donation will enable the libraries to purchase several new books each year and so keep current up-to-date literature on conservation available.

PAPER MILL EXTENDS FIRE PROTECTION.—The Hiawassee Land Company, a subsidiary of Bowaters, has fire crews and fire lane plows for use in putting out woods fires on their own land.

Supervisors of the McMinn County (Tenn.) Soil Conservation District contacted Allen P. Swayne, district forester for Hiawassee Land Company to find out if the fire crews could be made available to farmers to supplement the protection being provided by the State fire crews since most of the district cooperators are customers of the paper mill.

As a result, the supervisors and the Soil Conservation Service technicians, working with the district, are authorized to call the Bowaters' fire crews for help when State crews are not available.

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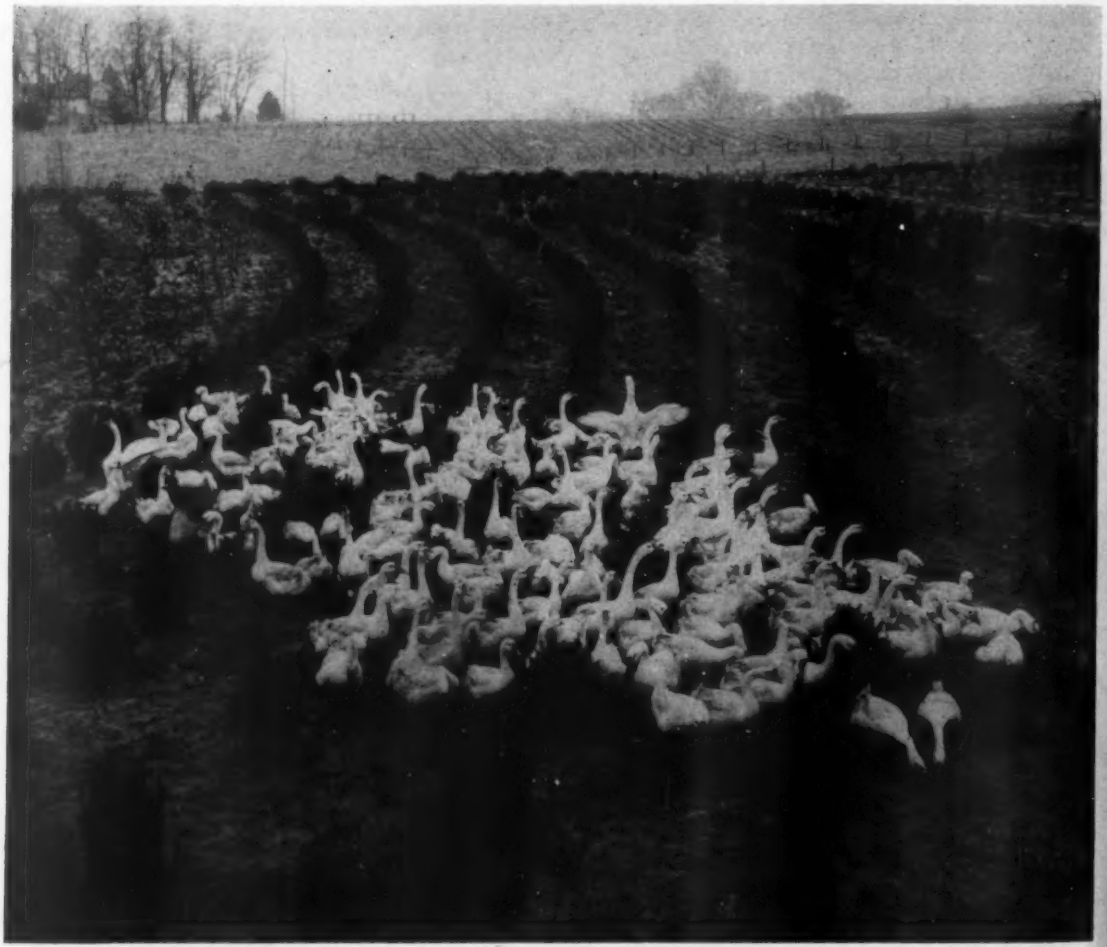

WEB-FOOTED HOE HANDS.—This flock of geese on the Forrest Keeling Nursery near Elsberry, Mo., do the work of 20 laborers in keeping down weeds, according to Hugh Steavonson manager of the nursery. Steavonson admits, however, that he still must hire a few human hoe hands because the geese refuse to eat such weeds as smartweed and wild onion. Photo by Sam Caldwell, used through courtesy of *St. Louis Post-Dispatch*.